

In response to Paragraph 6 of the Office Action, Applicants hereby provide the Examiner with additional information regarding Reference N in the Information Disclosure Statement (IDS) filed on February 18, 2000 (Paper No. 5). This reference, French Patent Publication No. 2 722 511, which was cited in the IDS as France 95 08510, is a foreign counterpart of U.S. Application No. 08/275,632, which is now abandoned. Applicants are enclosing copies of French Patent Publication No. 2 722 511 and the '632 application for the Examiner's review. Applicants submit that the information provided regarding French Patent Publication No. 2 722 511 now complies with the requirements of 37 C.F.R. § 1.98(a)(3). Accordingly, Applicants request that the Examiner fully consider this reference and acknowledge such consideration by initialing the attached Form 1449 at the appropriate location.

Applicants have made clarifying amendments to claims 2-11 to define the claimed invention more precisely. In addition, in an effort to expedite the prosecution of this application, Applicants have made substantive amendments to claims 21-23 to distinguish the claimed invention from the prior art more clearly.

Applicants respectfully request reconsideration of the rejection of claims 1 and 2 under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,730,834 to Gabriel. As will be fully explained below, the Gabriel patent does not disclose each and every feature of claims 1 and 2.

Independent claim 1 defines a method of cleaning the surface of a semiconductor wafer following a plasma etching operation. This method includes the operation of wetting the surface of the semiconductor wafer by using a non-splash rinse technique.

The Gabriel patent discloses a method for removing fluorine-containing residue from semiconductor wafers that have been subjected to a tungsten etch-back operation. The Gabriel patent teaches that rinsing the wafers in water in a non-oxygen containing atmosphere increases the amount of fluorine-containing residue that can be removed from the

surface of the wafers. Regarding the rinse step, the Gabriel patent discloses that a wafer is rinsed in water rinse chamber 52 with “water that has been heated above room temperature.” Column 3, lines 53-54. The Gabriel patent further discloses that “the wafer is rinsed for sixty seconds in water heated to 50 °C. at 500 revolutions per minute (rpm).” Column 3, lines 55-57.

The Gabriel patent does not disclose each and every feature of the method defined in independent claim 1 for at least the reason that this reference does not disclose the use of a non-splash rinse technique. In fact, the Gabriel patent does not describe the configuration of the outlet used to deliver the rinse water to the surface of the wafer. To the extent that the anticipation rejection may be based on principles of inherency, Applicants note that a reference inherently discloses a claimed feature only when that feature *necessarily* results from the teachings of the reference. *See* M.P.E.P. § 2112. The Gabriel patent does not disclose the configuration required to obtain non-splash rinse conditions. Of the parameters set forth in Applicants’ specification for obtaining non-splash rinse conditions, the Gabriel patent mentions only the rotational speed at which the wafer is rinsed. The disclosed rotational speed of 500 rpm is significantly faster than the 2 rpm to 20 rpm range of rotational speeds set forth in Applicants’ specification. Thus, the Gabriel patent does not reasonably support an assertion that the disclosed rinse step is necessarily a non-splash rinse step. As such, the Gabriel patent does not disclose each and every feature of claim 1, either expressly or under principles of inherency.

Accordingly, for at least the foregoing reasons, independent claim 1 is patentable under 35 U.S.C. § 102(b) over the Gabriel patent. Dependent claim 2, which depends from claim 1, is likewise patentable under 35 U.S.C. § 102(b) over the Gabriel patent for at least the same reasons set forth above for claim 1.

Applicants respectfully request reconsideration of the rejection of claims 3-11 under 35 U.S.C. § 103(a) as being unpatentable over Gabriel in view of U.S. Patent No. 5,809,832

to Gockel et al. (“the Gockel patent”). As will be fully explained below, the combination of the Gabriel patent in view of the Gockel patent would not have suggested to one having ordinary skill in the art the methods defined in claims 3-11.

Each of claims 3-11 ultimately depends from independent claim 1. As discussed above, claim 1 defines a method of cleaning the surface of a semiconductor wafer following a plasma etching operation that includes the operation of wetting the surface of the semiconductor wafer by using a non-splash rinse technique.

The Gockel patent discloses a semiconductor processing system that includes, among other things, a brush box containment apparatus for use with volatile chemical solutions, a roller positioning apparatus, and a brush placement device. The Gockel patent discloses that a wafer may be sprayed with water at a number of locations within the disclosed system including the load station, the brush box, and the spin, rinse, and dry station. Nothing in the Gockel patent, however, discloses or suggests wetting the surface of a wafer by using a non-splash rinse technique. Thus, the Gockel patent does not cure the deficiency of the Gabriel patent relative to claim 1.

Accordingly, independent claim 1 is patentable under 35 U.S.C. § 103(a) over the combination of Gabriel in view of Gockel. Dependent claims 3-11, each of which ultimately depends from claim 1, are likewise patentable under 35 U.S.C. § 103(a) over the combination of Gabriel in view of Gockel for at least the same reasons set forth above for claim 1.

Applicants respectfully request reconsideration of the rejection of claims 21-24 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,804,091 to Lo et al. (“the Lo patent”) in view of Gockel. As will be fully explained below, the combination of the Lo patent in view of the Gockel patent would not have suggested to one having ordinary skill in the art the methods defined in claims 21-24, as amended herein.

Applicants have amended independent claim 21 to define a method for cleaning a surface of a semiconductor wafer after a plasma etching operation. This method includes the

operation of wetting the surface of the semiconductor wafer by using a non-splash rinse technique. The non-splash rinse technique includes setting the outlet end of at least one delivery source at a specific angle relative to the surface of the semiconductor wafer, and applying liquid to the surface of the semiconductor wafer through the outlet end of the at least one delivery source.

The Lo patent discloses a method for preventing defects and particles after a tungsten etch-back operation. In the disclosed method, residues on the surface of a titanium nitride layer are removed by subjecting the wafer to megasonic shaking in deionized water. This step is also referred to as "D.I. water flushing with megasonic shaking." Column 2, lines 31-32. As such, the Lo patent does not disclose or suggest wetting a surface of a semiconductor wafer by using a non-splash rinse technique as specified in amended claim 21. As discussed above, the Gockel patent does not disclose or suggest wetting a surface of a semiconductor wafer by using a non-splash rinse technique. Thus, the combination of the Lo patent in view of the Gockel patent would not have suggested to one having ordinary skill in the art the method defined in claim 21, as amended herein.

Accordingly, independent claim 21, as amended herein, is patentable under 35 U.S.C. § 103(a) over the combination of Lo in view of Gockel. Dependent claims 22-24, each of which depends from claim 21, are likewise patentable under 35 U.S.C. § 103(a) over the combination of Lo in view of Gockel for at least the same reasons set forth above for claim 21.

As noted above, Applicants have added new claims 25-31. Independent claim 25 defines a method for cleaning a surface of a semiconductor wafer in which a semiconductor wafer that has been subjected to a plasma etching operation is received. An outlet end of at least one liquid delivery source is positioned relative to the surface of the semiconductor wafer so that the outlet end overlies an edge of the wafer by a distance in a range from about 2 mm to about 30 mm, the outlet end is oriented at an angle in a range from about 5 degrees

to about 35 degrees relative to the surface of the wafer, and the outlet end is disposed above the surface of the wafer by a distance in a range from about 2 mm to about 15 mm. Liquid is applied to the surface of the wafer through the outlet end of the at least one liquid delivery source. Dependent claims 26-31 specify additional features of the method defined in claim 25.

As discussed in Applicants' specification, the positioning of the liquid outlet in accordance with the parameters specified in claim 25 minimizes splashing during wetting of the surface of a semiconductor wafer. Thus, for at least the reasons discussed above, the Gabriel, Gockel, and Lo patents do not disclose or suggest the methods defined in claims 25-31. Accordingly, claims 25-31 are patentable under 35 U.S.C. §§ 102 and 103 over the Gabriel, Gockel, and Lo patents, whether considered alone or in combination.

In view of the foregoing, Applicants respectfully request reconsideration and reexamination of claims 1-11 and 21-24, as amended herein, and examination of new claims 25-31, and submit that these claims are in condition for allowance. Accordingly, a notice of allowance is respectfully requested. In the event a telephone conversation would expedite the prosecution of this application, the Examiner may reach the undersigned at (408) 749-6902. If any fees are due in connection with the filing of this paper, then the Commissioner is authorized to charge such fees to Deposit Account No. 50-0805 (Order No. LAM1P109). A copy of the transmittal is enclosed for this purpose.

Respectfully submitted,
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